CALIFORNIA DIVISION OF MINES AND GEOLOGY

Supplement #1 to Fault Evaluation Report FER-39a

March 20, 1978

1. Name of fault: Cucamonga fault.

4. References (aerial photography)

Designation: Fairchild C-829

Date: 1930

Type: Black and white, stereo

Scale: 1:7,200

Coverage: Eastern Los Angeles County and western San Bernardino County including the Red Hill fault, the western half of the Cucamonga fault, and the eastern ends of the Sierra Madre fault zone and the San Jose fault.

Availability: Fairchild aerial photography collection, Geology Department, Whittier College, Whittier, California.

Designation: Fairchild C-3668

Date: 9/8/35

Type: Black and white, stereo

Scale: 1:21,000

Coverage: The eastern half of the Cucamonga fault zone, and part of Lytle Wash.

Availability: Fairchild aerial photography collection, Geology Department, Whittier College, Whittier, California.

Designation: GS-VBNF

Date: 4/16/66

Type: Black and white, stereo

Scale: 1:12,000

Coverage: Cucamonga fault zone

Availability: San Francisco District aerial photography file, California Division of Mines and Geology, Ferry Building, San Francisco.

Designation: SB02 06071

Date: 8/20/72

Type: Black and white, stereo

Scale: 1:18,540

Coverage: Cucamonga fault zone

Availability: San Francisco District aerial photography file, California Division of Mines and Geology, Ferry Building, San Francisco.

6 & 7. <u>Interpretation of aerial photography and field observations</u>

The aerial photo sets were examined for scarps and other fault-generated geomorphic features. The other geomorphic features, such as closed depressions or offset drainages were not observed along this part of the San Gabriel Range front. The fault scarps were generally observable to an equal extent on all of the four photo sets used, as very little urbanization or cultivation had crept into the area of the fault zone by the date of the latest photo set (1972). The scarps seen on the photos, where they appeared to be of fault origin, were compiled on 7½ minute topographic quadrangle maps. Comparing this to the map of Morton (1976), it appears that in most cases both of us had observed the same scarps, but there is local disparity in the location and length of the scarps.

I spent two days field-checking the features that I observed on the photos. Because of recent heavy rains in southern California, some parts of the 21 km-long fault zone were not accessible. However, nearly all of the features within the Mt. Baldy and Cucamonga Peak quadrangles were checked.

In several places, features that I had thought to be fault scarps (from the photos) turned out to be man-made agricultural or drainage-control excavations. In one place, just east of San Antonio Wash, a suspected fault scarp turned out to be only an erosional scarp caused by side-cutting of the eastern side of the San Antonio fan. In several places I observed low fault scarps on the ground that I had not observed on the aerial photos. These scarps were generally no more than one meter high.

No effort was made, during the field checking, to examine faults that are not manifested by recognizable scarps. Most of the faults in that category occur within the bedrock terrane of the lower range front, and many have been mapped by Morton (1976). It appears that those faults have been totally, or almost totally, inactive during Holocene and latest Pleistocene time because, where they project beneath the older terraces of the larger drainages, there is no offset of the terrace surface.

After completing the field reconnaissance, I recompiled the photo and ground data onto another set of 7½ minute quadrangle sheets figures 5a, 5b, and 5c of this FER Supplement). This mapping differs from Morton's (1976) map in two principal respects: (1) small differences in fault location that apparently represent plotting errors, and (2) in many places Morton shows longer fault traces than I do. On his map he extends many of the solid-line faults as dashed lines, but I was unable to find such continuations of the fault scarps (or other evidence of faulting) on the ground. Apparently, he is more willing to interpolate or extrapolate the faults than I am.

Regarding recency of faulting, I observed three relative ages of scarps. The youngest (annotated with the symbol H on figures 5a and 5b) are steep and only very slightly modified by erosion. These scarps were probably generated totally or in part by Holocene faulting. The second category of scarps (annotated H? on figures 5a, 5b, and 5c) are still well defined, but show much more modification by erosion. These may, in part, have been generated by faulting as recent as Holocene time. The third category of scarps (annotated L on figures 5a, 5b, and 5c) are commonly poorly defined and are extensively eroded. I saw no evidence for faulting as young as Holocene age along these scarps.

The largest scarp at the eastern end of the Cucamonga fault zone (the long dotted trace on figure 5a) poses significant problems in interpretation. It is a high, steep scarp that forms the western boundary of the upper part of the Lytle Creek fan. The question is: Is this a fault scarp, or is it an erosional scarp generated by side-cutting along the northwestern side of the Lytle fan? I found no conclusive evidence to support or deny either interpretation. My conclusion, however, is that it is more likely to be a fault scarp, the base of which has been buried by the actively-aggrading Lytle fan. Generally, where a drainage sidecuts, in a situation such as this, the sidecutting penetrates into the adjacent terrane in an irregular manner. The scarp that forms has an "in and out" appearance, reflecting the variability of erosional resistance, the sinuosity of the sidecutting drainage, and, most importantly, the effect of tributary drainages flowing down across the scarp and building secondary fans out onto the main fan.

The scarp that is under consideration here is quite linear and shows no deflections where it is crossed by at least eight significant tributary drainages such as Duncan Canyon. If it is a fault scarp, the linearity of the scarp could, of course, in no way be affected by the tributary drainages. Thus, my interpretation at this time is that it is a fault scarp. Its steepness and good definition indicate it was generated, at least in part, by Holocene faulting.

8. Conclusions:

It is unlikely that all of the fault scarps within the Cucamonga fault zone were generated totally by pre-Holocene faulting. However, we have no hard evidence for Holocene faulting. The geomorphic youthfulness of the scarps is the principal evidence upon which I am making the subjective judgement that at least some of the scarps were formed during Holocene time. Morton (1976) believes that much of the faulted alluvium is of Holocene age. This, also, is a subjective judgement, as he (personal communication, 10-7-77) has no hard evidence to substantiate this. Holocene faulting is stated or implied by several other earlier workers in this area but, again, all of these appear to be no more than subjective judgements.

It is my judgement that the probability is greater than 0.5 that significant Holocene faulting has occurred along the Cucamonga fault zone.

9. Recommendations

I recommend that the entire length of the fault zone be zoned. The specific fault traces to be zoned are shown on figures 6a, 6b, and 6c of this supplement. These traces include all of those labeled H and H? on figures 5a, 5b, and 5c, plus a few of the bedrock faults mapped by Morton (1976). The bedrock faults are included where they are associated with a modified scarp and are a direct lateral continuation of a H or H? scarp in alluvium.

The part of the Cucamonga fault zone that lies within the Devore quadrangle has already been zoned (California Division of Mines and Geology, 1974). That zone includes all of the fault scarps mapped by the writer (figure 5a of this supplement) except the small scarp at the western margin of the quadrangle. Part of that scarp lies to the north of the zone. That scarp, labeled H? on figure 5a, is in the "possible Holocene faulting" category. I recommend that the zoning within the Devore quadrangle be modified to include that scarp.

10. Investigating geologist's name and date:

Drew P. Smith

DREW P. SMITH
Assistant Aphid
March 20, 1978

I agree with the recommendation to zone those strands of the Cucamonga fault shown on Fig. 6b and 6c (Cucamonga Peak & Mt. Baldy quads). I disagree with the recommendation to revise the Devore SSZ map (see attached) solely on the basis of the short (100-150') fault segment that lies outside the zone near TP 38. If any revisions are made to this SSZ map, then the boundaries should be extensively revised to fit all of the new data in this FER.
EWH
4/6/78

(FER-51a)

State of California | The Resources Agency

Memorandum

To : Earl W. Hart

Date: August 10, 1978

Telephone: ATSS (   )
(   )

From : **Department of Conservation**
Division of Mines and Geology—San Francisco 94111

Subject: A consulting report from Leighton and Associates, dated July 21, 1978, their project no. 677027-02, which deals with a proposed subdivision tract near the mouth of Cucamonga Canyon

The tract is crossed by fault traces of the Cucamonga fault zone. I have no disagreement with the findings and interpretations of Leighton and Associates in regard to the fault that passes through the southern part of the tract. That fault is characterized by well-defined scarps. The fault they have recognized there is in essentially the same location as the fault shown on the DMG preliminary review maps released on July 1, 1978--Mt. Baldy and Cucamonga quadrangles.

Regarding the northern fault, however, I disagree with their interpretation that the fault has been active during Holocene time. An examination of aerial photography (DMG designation SB02, frames 177 and 178) shows no apparent offset of either the T_2 or T_1 terrace surfaces (figure 2) where fault passes beneath them. The younger terrace surface (T_2) may have been abandoned before Holocene time, and the older terrace surface (T_1) has almost certainly been abandoned since before Holocene time. The younger terrace is about 130 feet above the present Cucamonga wash, and the older terrace is about 200 feet above the wash. I do not think that depth of entrenchment has occurred in only the past 11,000 years. Leighton and Associates even state (p.3) that they assume the ..."alluvial fans in the area were formed about 11,000 to 30,000 years ago..."

Leighton and Associates make their Holocene activity judgement on the basis of the trench exposures. However, these were shallow trenches (typically 6 feet deep) within very coarse-grained alluvial debris. Interpretation of factors relating to recency of activity is very difficult in that kind of material. Furthermore, their trench logs are very sketchy. It makes me doubt that their interpretations are based on good, clearcut observations.

I had a telephone conversation with John F. Hoefferle (the engineering geologist who signed the report) on August 8, 1978.

He provided no new information about the northern fault except that he had looked for surface scarps and found none.

I conclude that this fault has not been active during Holocene time. I recommend that this fault not be zoned. I recommend that no further investigation of this fault be undertaken.

Drew P. Smith

DREW P. SMITH
Geologist
San Francisco District Office

DPS/dp

Drew
I concur with the recommendation.
place in FER file.
EWH
10/17/78

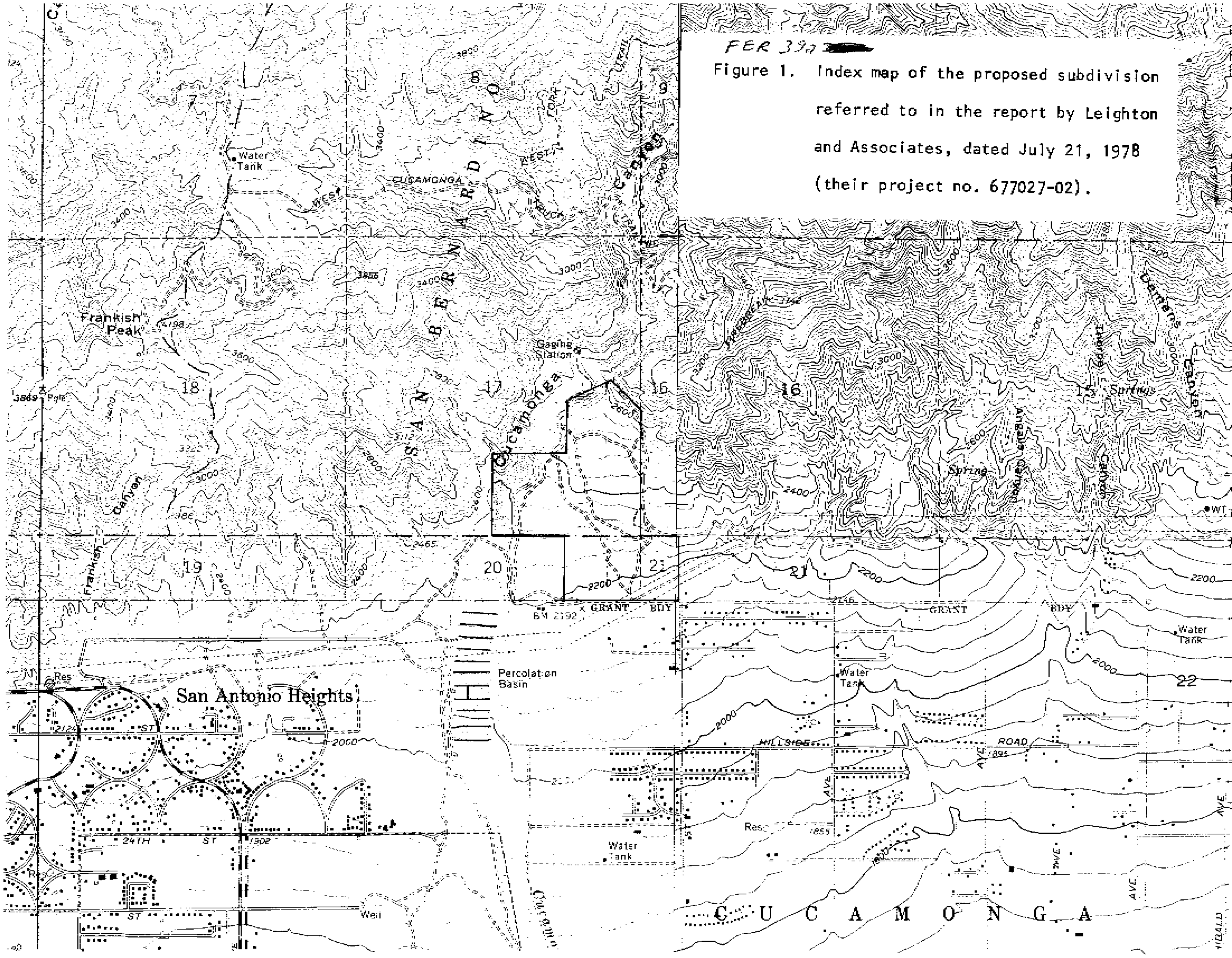

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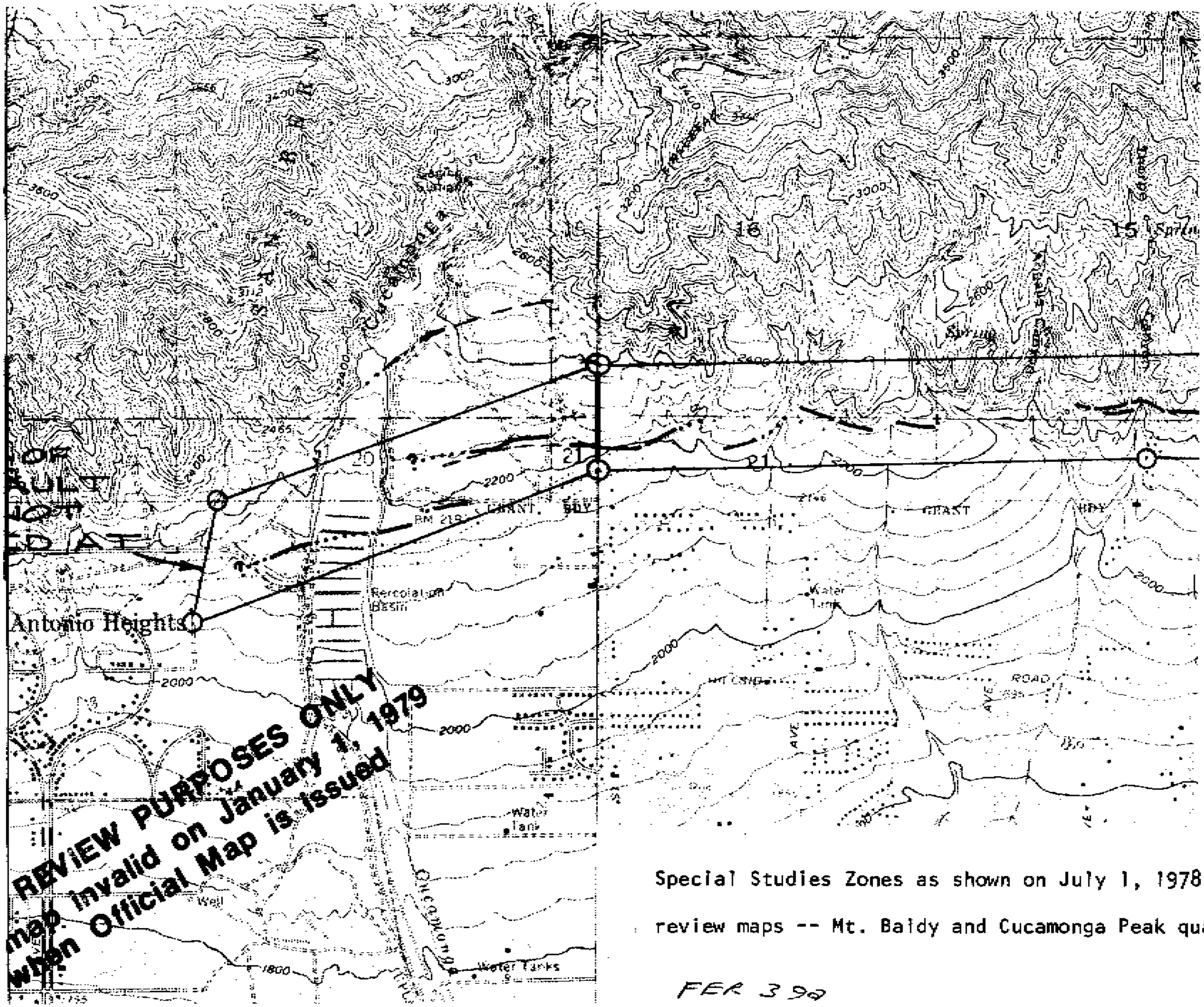
Figure 1. Index map of the proposed subdivision referred to in the report by Leighton and Associates, dated July 21, 1978 (their project no. 677027-02).



Special Studies Zones as shown on July 1, 1978 provisional review maps -- Mt. Baldy and Cucamonga Peak quadrangles.

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